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ABSTRACT

The purpose of these studies was to test the hypothesis that thematization affects the probability that a probe word will produce meaning-preserving recall of a sentence that is part of a discourse. Sentences were constructed along the lines of subject-verb-object and were presented in three experiments: free recall of isolated sentences, prompted recall of isolated sentences, and prompted recall of sentences from paragraphs. The experiments were: (1) Free Recall, No Context; (2) Prompted Recall, No Context; and (3) Prompted Recall, Paragraph Context. University of Pittsburgh undergraduates served as subjects for all three experiments. The results indicated that the effectiveness of words from sentences as retrieval prompts for sentence meaning is dependent upon thematization. When a sentence was presented in isolation, without context, and when the imagery and concreteness of the subject-noun and object-noun were high and equal, there was no difference between the two nouns in prompt effectiveness. However, when the subject was the theme of the paragraph, the subject was a much better prompt than the object. When the object was the theme, subject and object were equal. (WR)

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THEMATIZATION AND SENTENCE RETRIEVAL

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Abstract

The effectiveness of words from sentences as retrieval prompts for sentence meaning is shown to depend upon thematization. When a sentence was presented in isolation, without context, and when the imagery and concreteness of the subject-noun and object-noun were high and equal, there was no difference between the two nouns in prompt effectiveness. For example, in The serfs rebelled against the baron, serfs and baron were equally good prompts for retrieval of the sentence. When the sentence appeared at the end of a paragraph, the retrieval power of both nouns was greatly increased. However, when the subject (serfs) was the theme of the paragraph, the subject was a much better prompt than the object. When the object (baron) was the theme, subject and object were again equal. These results are explained in terms of the discourse function of thematization.

The paper will be of interest to experimental psychologists and psycholinguists in the area of memory and comprehension of natural language. The experimental results may have some general value for the analysis of discourse processes.

THEMATIZATION AND SENTENCE RETRIEVAL[1]

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The probability of retrieving information from memory is influenced by the characteristics of the prompt provided to bring about retrieval. In psycholinguistics, this fact has had significance for attempts to understand the relationship between the structure of sentences and their representation in memory. A general result of previous research has been to show that the probability that a given prompt will produce sentence retrieval is related to its structural role in the sentence (Anderson & Bower, 1971; Blumenthal, 1967; Perfetti, 1973, in press; Wanner, 1968). The evidence has been interpreted to suggest that the deep structure role of the prompt is a critical factor, with deep subject a more powerful retrieval prompt that other structural elements. While the deep subject effect does appear to be independent of surface structure, Perfetti (1973, in press) has shown that it is not independent of semantic role. In sentences such as (a) The Mayor denounced the Governor and (b) The Mayor underwent pressure from the Governor, the deep subject Mayor was a better prompt as an agent as in (a) than as a recipient as in (b), while the reverse was true for the "deep object" Governor. Of additional significance in the Perfetti (1973, in press) experiments is that within a sentence there was no difference between subject and object prompt

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[1] Parts of this research were reported at the meetings of the Midwestern Psychological Association, Chicago, May 1973. Roberta Golinkoff and Alan Lesgold provided valuable comments and criticism on an earlier draft of the paper.

effectiveness, in contrast to other studies (Blumenthal, 1967; Wanner, 1968).

A related aspect of the sentence retrieval problem is the role of imagery and concreteness. The subject-object pairs of Perfetti (1973, in press) were from highly concrete animate word pairs. Other research has shown that concrete words are more powerful retrieval prompts than abstract words, and, as James (1972) has observed, citing the data of Clark (1965), it is likely that the subjects of sentences will be more concrete than objects unless the difference is specifically controlled for. James' (1972) free-recall experiment in which imagery values of sentence subject and object were carefully controlled showed the interpretive difficulties of previous free-recall research which had not controlled for imagery. The same problem must be suggested for prompted-recall research. The claim that the linguistic role of deep subject is responsible for its superior prompt effectiveness, if any, depends on separating that role from non-syntactic factors.

Rather than suppose that either linguistic or imagery factors are fundamental, we suggest a different way of characterizing the relation between the retrieval process and an element used to cue the retrieval process. Information to be retrieved is normally an integrated set of relations. While there are many cases in which what is stored are fragments of these relationships, these non-redintegrative cases (Horowitz & Prytulak, 1969) are not typical of language processes, except when conditions are arranged to discourage integrative processing, such as the presentation of isolated simple sentences of the sort used by Anderson and Bower (1971). That part of the information that will provide the effective means of retrieval for the entire information is that part which is, to chose a neutral term, the most "focused." We assume that

among the factors affecting the focus of a linguistic element are imaginal, semantic, and thematic properties associated with its meaning and its role in a communication.

In discourse, elements are focused through thematization. By thematization, we mean the discourse processes by which a referent comes to be developed as the central subject of the disccurse. The linguistic results of these processes include what Chafe (1972) has called the "foreground" of a message. Thus, the theme will always be a foregrounded element, but not necessarily vice versa. We hypothesize that thematization of a referent takes place when propositions containing the referent occur and when sentence constituents identify the referent.[2] Note that it is not a word that is thematized, but a referent. Thus, a paragraph that identifies a certain Dr. Jones and relates that he is a surgeon, is thematizing a referent that is realized by the expressions Dr. Jones, the surgeon, the doctor, he, and other noun phrases identifying the referent.

There are convergent operations that can experimentally define the theme of a discourse. We have chosen two: (1) the theme of a discourse appears in more propositions and identity constituents (in the sense of McCawley, 1970b) than any non-theme; and (2) readers agree that a given word is the theme of a discourse (or strictly speaking, that it represents the theme of the discourse).

The present experiments were designed to test the hypothesis that thematization affects the probability that a probe word will produce

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[2] The separation in grammatical analysis of propositions, containing variables as noun phrases, from identity constituents, which identify the noun phrase variables, is an interesting linguistics hypothesis (McCawley, 1970b) of undetermined significance for a hypothesized process of thematization.

meaning-preserving recall of a sentence that is part of a discourse. Sentences were constructed along the lines of subject-verb-object and were presented in three experiments: free recall of isolated sentences, prompted recall of isolated sentences, and prompted recall of sentences from paragraphs. The prompts were the grammatical subjects and the objects of the sentence. (They were also, respectively, semantic agents and recipients.) The thematization hypothesis predicts that the better prompt will be that word reflecting a thematized referent, regardless of whether it is subject or object. Furthermore, on the assumption that imagery is just a special means of thematization, prompt differences in isolated sentences should be negligible when both nouns are high in imagery. The free-recall experiment was to obtain data on the redintegrative properties of the sentences and data on partial recall. The methods of three experiments are described separately below, followed by a combined description of results.

Methods

Experiment I: Free Recall, No Context

Materials. Twenty-four active sentences of the form subject-verb-object (S-V-O) were constructed such that the two nouns in a sentence were equated on the basis of frequency (Kucera & Francis, 1967), and imagery and concreteness (Paivio, Yuille, & Madigan, 1968). All nouns used had imagery ratings of greater than 5.07 and concreteness ratings of greater than 5.49. For each verb, a synonym was chosen such that the meaning of the sentence was preserved when the synonym was substituted for the original verb.

The sentences all had animate subject nouns and either animate or inanimate object nouns. All verbs were transitive and all sentences were in the active voice.

Two presentation lists (A and B) were constructed such that each list contained six animate-animate and six animate-inanimate sentences. Presentation order of the sentences was assigned randomly. There were four presentation orders for each list to counterbalance list position effects. The retention test was a free-recall task.

Subjects. Thirty-two University of Pittsburgh undergraduates, 16 for each list, participated in this experiment as part of the introductory psychology course requirement.

Procedure. Sentences were presented to individual subjects on a memory drum. The sentence was exposed for five seconds and read aloud by the subject. Following each sentence, a synonym for the verb of the sentence appeared alone for five seconds, during which time the subject was to "say the sentence aloud using the new verb to link the old subject and object." The purpose of the synonym procedure was to encourage semantic processing of the sentence by the subject.

The recall task followed immediately a single presentation of the 12 sentences. Each subject received a booklet of 12 blank pages and was instructed to recall the sentences, one to a page. The subject was told to "write down as much of the original sentence as you can remember. If you cannot remember the exact wording of the original sentence, write what you remember--try to capture the meaning of the sentence." Subjects had five minutes to complete the recall task.

Experiment II: Prompted Recall, No Context[3]

Experiment II was actually two experiments using identical materials and procedures. The initial experiment involved 32 subjects, 16 for each of the two lists. The reason for the replication was the importance of the results for theoretical arguments and their apparent deviations from results of seemingly similar experiments.

Design and Materials. The experiment was a 2x2 repeated measures design in which list was the between-subjects variable and syntactic role of the prompt the within-subjects variable. Subjects were prompted once on each of the to-be-learned sentences with either the subject or object. Each person received six subject prompts and six object prompts, and each sentence was prompted with subject and object an equal number of times. There were four different presentation orders, to balance occurrence of sentences in the beginning, middle, or end of the list. The order of the prompts during the test corresponded to the sentence presentation order. The materials were the 24 sentences used in Experiment I.

Subjects. Eighty subjects served individually in the experiment. The initial group of 32 was chosen mainly from the University of Pittsburgh introductory psychology classes but included a few employees of the Learning Research and Development Center. The replication group of 48 was drawn exclusively from introductory psychology classes.

Procedure. The presentation of the sentences was the same as for Experiment I. The prompted-recall task immediately followed

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[3]The first of the two experiments in this section was carried out by Robert Lindsey, who is also to be acknowledged as the author of some of the more creative prose used as paragraphs in Experiment III.

completion of sentence presentation. Each person received a test booklet with 12 pages, each containing a noun prompt. The subject was instructed to write as much of the sentence as he could remember using the original verb if possible. Subjects had four minutes for recall and could go through the booklet once only in the prescribed order. No one had any trouble completing the task in the time given.

Experiment III: Prompted Recall, Paragraph Context

Design and Materials. The experiment was designed as a three-factor repeated measures experiment (2x2x2) with the between-subject variable of list providing a replication of the effect of the main variables of interest: theme and syntactic role, which were within-subject variables.

Twenty-four pairs of paragraphs were constructed, each using a sentence from Experiment I and II as its final sentence, which was underlined. Each pair of paragraphs comprised two distinct thematic approaches to a single event. One paragraph of each pair had as its theme the referent underlying the subject of the final sentence; the other paragraph had as its theme the referent underlying the object of the final sentence. For example, the two paragraphs for the sentence The serfs rebelled against the baron both described the same pseudo-historical event, namely, the uncovering of a historical document revealing that a certain Polish baron of the eighteenth century had serfs whom he treated harshly, and each paragraph concluded by informing the reader of the serfs' action against the baron. The two versions of the paragraph differed in that the paragraph subject theme contained more information about the serfs, and the paragraph object theme contained more information about the baron. The nature of the thematic variable is elaborated

in Table 1, which shows sample paragraphs. In general, thematization was accomplished not merely by use of the probe, but by use of the referent underlying the probe, including proper name, alternative designations, and pronouns. The number of underlying propositions containing the referent was the measure of thematization. The average number of propositions containing the referents underlying the two sentence prompts was as follows: Subject Theme: Mean number of propositions containing subject = 11.63, mean number of propositions containing object = 4.71; Object Theme: Mean number of subject propositions = 5.13, mean number of object propositions = 10.92. The paragraphs averaged 11.48 double-spaced lines of type (range: 9-14). They formed two separate lists of twelve with no content overlap between any two paragraphs from the same list.

Two paragraph orders were derived for each of the two lists of Experiment I and II such that the "distance" from the middle of the list, averaged over the two orders, was equal for all paragraphs. Each subject received an individual presentation package containing twelve passages, six subject theme and six object theme, one per page. Across all subjects seeing a given list, each paragraph appeared in its two alternate forms an equal number of times.

The test was a prompted-recall task for which each subject was provided an individual test booklet, each page containing a single prompt word from the test sentence. Each person saw six subject prompts and six object prompts. Prompt type was balanced across theme type, with the result that each person was prompted three times each by thematized subject, non-thematized subject, thematized object, and non-thematized object.

Table 1

Sample Paragraphs Used in Experiment III
Final Sentence Is Prompted with Either Subject or Object

Subject Theme

A touching human drama had a happy ending yesterday in Hollywood, a town often accused of being mercenary and heartless.

Famed singer Marty Apple is widely known for his nightclub act and his many hit records. Less known, but just as important to him, is Marty's long association with the Hollywood Children's Hospital. He has participated in every fund raising drive for the hospital in the last ten years, singing in over 50 benefit concerts. Last week Apple heard about an infant who had been abandoned on the front steps of the hospital. Yesterday, the singer adopted the infant.

Object Theme

A touching human drama had a happy ending yesterday in Hollywood, a town often accused of being mercenary and heartless.

Last week a three week old baby girl was found in a basket on the front steps of Hollywood Children's Hospital. She was wrapped in a new blanket but there were no clues identifying her, not even a note. The infant appeared hungry but was otherwise in perfect health. A check with other hospitals in California failed to reveal the origin of the child. The hospital was about to turn her over to the county orphanage when the famous singer, Marty Apple, heard about the baby's situation. Yesterday, the singer adopted the infant.

Subject Theme

A small but significant gap in Polish history appears to have been filled by some ancient documents recently discovered by Professor M.J. Pulaski of Harvard's Center for Eastern European Studies.

The documents found in a centuries old castle in southern Poland were apparently written by an educated serf who served as a scribe at the castle in the 17th century. According to Prof. Pulaski, few details were known about the life of the serfs until now. The documents tell much about the daily life and culture of the serfs as well as the hardships they suffered under a particularly harsh nobleman, Baron Wozjik. The writings describe the growing discontent of the serfs, and became more revolutionary in tone until they end quite dramatically: the serfs rebelled against the baron.

Object Theme

A small but significant gap in Polish history appears to have been filled by some ancient documents recently discovered by Professor M.J. Pulaski of Harvard's Center for Eastern European Studies.

The documents found in a centuries old castle in southern Poland tell of the fate of Baron Wozjik who had been an important advisor to the king in the 17th century. According to Prof. Pulaski, Baron Wozjik's influence suddenly declined in the mid-1600's but scholars had been unable to account for the decline. The documents reveal that the baron's power rested upon the wealth of his vast holdings in farmland. In 1651 he began to have difficulties with his labor force made up wholly of serfs, drastically cutting back agricultural production: the serfs rebelled against the baron.

Subjects. Ninety-six University of Pittsburgh undergraduates participated in groups of eight as partial fulfillment of the introductory psychology course requirement.

Procedure. Each subject was given his own paragraph package and was told to "read each passage for meaning and understanding," and that we "want to find out how you remember an entire passage and how the final underlined sentence helps you to do that." The reading was self-paced by the subject with the restriction that he could not look back at previous passages.

The subject was told to answer the multiple-choice question that appeared at the bottom of each page before proceeding to the next passage. The question asked what type of publication the passage was most likely to appear in. (The choices were always the Pittsburgh Press, Reader's Digest, Time Magazine, and the New Yorker.) The task was introduced to encourage a reading of the full text. The subject was informed that upon completion of the presentation booklet, he would receive a test booklet containing some questions about the passages.

The test booklet was given to a subject as soon as he raised his hand indicating that he was finished reading the twelve passages. The subject read the instructions on the test booklet which asked him to recall the underlined sentence which contained the word on the test booklet. He was told to try to produce as much of the meaning as possible if he could not recall the exact words. Each subject proceeded at his own pace within an overall time limit of five minutes. He was permitted to go through the booklet once only in the prescribed order.

Results

The data of the three experiments were two classes of response: meaning-preserving recall of the sentence (MPR), and various fragmentary recalls. The meaning-preserving category includes, in addition to verbatim correct reproductions, the production of complete sentences that preserve the essential meaning of the sentence in a paraphrase. Interjudge agreement for the two investigators in use of this category was 98 percent and was better than 95 percent between different judges in Perfetti (1973, in press).

Experiment I: Free Recall, No Context

The free-recall task served to establish the redintegrative quality of the sentences and the comparability of the two lists. The probabilities of meaning-preserving recall were almost identical for the two lists, .33 for list A and .32 for list B. (The verbatim recall probabilities were .20 and .21, respectively.) The conditional probability of an MPR given a recall attempt was .64 and .69 for lists A and B, respectively. These figures indicate marginal redintegration, since fragmentary recalls were produced about one-third of the time. If the more conservative verbatim measure is used, the redintegration, of course, is lower. However, the MPR measure seems appropriate as an indication of an integrated semantic unit. As to whether the subject or object was more available, subjects were recalled without objects 16 percent of the time, while objects were recalled without subjects 9 percent of the time. Subjects were recalled without verbs or objects on 11 percent of the attempts, while objects were recalled without subjects or verbs on only 1.5 percent of the attempts. The slightly greater availability of subjects

would allow the prediction that subjects will be better prompts for an integrated memory unit.

Experiment II: Prompted Recall, No Context

The initial experiment and its replication produced the same basic result with respect to prompt effect. In both cases, there was no difference in recall due to syntactic role of prompt, no difference due to list, and no interaction. A combined analysis of variance produced $F < 1$ for list ($df = 1, 78$) and $F(1, 78) = 1.08$ for the Prompt x List interaction. The probability of meaning-preserving recall can be seen in Table 2 along with the MPR for Experiments I and III.

Table 2

Probability of Meaning-Preserving Recall for the Three Experiments Combined over Two Lists

Condition	Prompt		
	None	Subject	Object
No Context Free Recall (Experiment I)	.32	——	——
No Context Prompted Recall (Experiment II)	——	.36	.36
Paragraph Context Subject Thematized (Experiment III)	——	.65	.48
Paragraph Context Object Thematized (Experiment III)	——	.65	.61

Experiment III: Prompted Recall, Paragraph Context

When the sentences occurred as the final sentence of a paragraph, the thematized noun was a more effective prompt than the non-thematized noun. Furthermore, syntactic role was significant. The repeated measures analysis of variance produced F (1, 94) = 4.75 ($p < .05$) for theme and F (1, 94) = 11.06 ($p < .005$) for syntactic role. List was again not significant, F (1, 94) = 2.45. The Theme x Syntactic Role interaction was significant F (1, 94) = 4.86 ($p < .05$). No interaction involving list approached significance, with the largest F = 1.5.

Table 2 shows the effect of thematization on prompt effectiveness. The data are given for the two lists combined since there was no significant difference between them in any of the experiments. The comparison is between Experiment II and III: Only in the presence of paragraph context was there any difference in prompt effectiveness. Given a thematized context, the subject was a better prompt than the object, and the thematized noun was a better prompt than the non-thematized noun. The significant Theme x Syntactic Role interaction shows the effect of thematization holds only when the object is prompt. The subject was equally good as prompt whether it or the object had been thematized (probability of MPR = .65 in each case). However, the object was as effective as the subject when the object was thematized (.61), but substantially less effective when the subject was thematized (.48). Tests for simple effects give statistical support to this description. The effect of the theme factor within object was associated with F (1, 286) = 5.63 ($p < .05$).

Partial Recalls

Partial recalls were analyzed for all experiments, and those for the two prompting experiments are shown in Table 3. The numbers in Table 3 are the conditional probabilities of various partial and meaning-preserving recalls given that a response attempt was made. Several significant patterns can be seen:

1. As would be expected, many more recalls were attempted with paragraph context than without.

2. Across all context conditions, a subject prompt was more redintegrative than an object prompt. Given an attempt at recall, the subject produced a meaning-preserving recall about 72 percent of the time compared with 61 percent for an object prompt (means of last row of Table 3). For all context conditions, an object prompt was more likely than a subject prompt to produce a verb only. The difference is large, about 3 to 1 on the average, and consistent across conditions of context.

This last result is very similar to what was observed in the free-recall experiment. There, the conditional probability that a partial recall contained the verb given that it contained the object (but not the subject) was .83. The probability that it contained the verb given the subject (but not the object) was .33. Thus, in both free and prompted recall, the verb appears to be more closely associated with the object than with the subject.

Table 3

Probabilities of Partial and Meaning-Preserving Recalls Given a Recall Attempt

Recall	No Context (Experiment II)		Paragraph Context (Experiment III)			
			Theme			
			Subject		Object	
	Prompt		Prompt		Prompt	
Category	S	O	S	O	S	O
Probability of Attempted Recall	.54	.62	.83	.87	.83	.88
Category of Attempted Recall						
Verb Only	.08	.27	.08	.32	.11	.20
Other Noun Only	.04	.04	.01	.01	.01	.01
Miscellaneous	.21	.11	.14	.11	.10	.10
Meaning-Preserving Recall	.67	.58	.78	.56	.78	.69

Note. The first line shows the observed probability that S's response protocol showed any word other than the prompt. The next two lines show the probability that a response attempt contained the given correct element from the sentence but was incorrect. The miscellaneous category includes various incorrect and partial recalls that did not contain any correct information from the sentence. The last line is the probability of MPR given any attempted response.

The other comparison to be made with free recall is that in free recall, subjects were involved in more partial recalls than objects (20 percent and 13 percent, respectively). The difference between the free recall and the prompted recall is what would be expected according to the hypothesized relation between availability and redintegrative power (Horowitz & Prytulak, 1969). The subject is more available (free recall) and while it is not a better prompt in the absence of thematization, it does have a higher conditional probability of recall given an attempt is made.

A final point in connection with Experiment III concerns theme definition. A new group of 32 subjects was asked to read the paragraphs of Experiment III and to indicate which of the nouns they thought represented the theme of the paragraph. Eight subjects judged a given paragraph in a given thematic condition. In each case, the choice was between the two nouns of the final sentence. The percent agreement was as follows: List A, Subject Theme: 82 percent; List A, Object Theme: 95 percent; List B, Subject Theme: 98 percent; List B, Object Theme: 98 percent. The lower agreement for the Subject Theme of List A is due to one paragraph which produced agreement by only three of eight judges. This is the only one of the 24 paragraphs in which the judges did not agree with our designation of theme.

Discussion

We interpret the results of these experiments to support the hypothesis that a memory probe for a semantic unit is effective in relation to its thematization. A probe which has been thematized by its occurrence in a meaningful passage acquires a retrieval power that it otherwise lacks.

One might have expected to discover that the significance of theme was to overcome syntactic-semantic factors operating at the sentence level. Especially one might expect that grammatical subject, either because of its syntactic function or its semantic role (as agent in these sentences), has favored status in the memory for sentence meaning and should provide easier access to this memory. However, one of the key results of these experiments is that there is no support for this expectation. The fact that this result was found in two separate experiments provides some confidence in its reliability. The critical factor here is the control for imagery and concreteness. We note again the parallel to James' (1972) data for free recall. Control for imagery and concreteness eliminates subject-object difference for free recall and eliminates differences in prompt effectiveness. There is further support for this claim from the data of Perfetti (1973, in press) which show prompt differences between sentences varying in semantic-syntactic correspondences, but not within sentences between subject and object. In addition, a recent study by Elias (1973) has found no differences in subject-object prompt effectiveness for either high-I or low-I sentences in which subject and object were equal in I-value within a sentence.

A parallel here is the significance of concreteness and imagery in paired associate learning. Paivio (1965), for example, demonstrated that the concreteness effect in paired associate learning was large on the stimulus side and relatively small on the response side. The favored interpretation (Paivio, 1971) is that a concrete stimulus provides a "conceptual peg" on to which the response can be attached. In our terms, a thematized memory probe provides a pre-established referent for constructing representations of propositions and later retrieving them.

We are not suggesting that imagery is the fundamental variable for organizing memory. On the contrary, we believe that the present data support the interpretation that imagery is the functional equivalent of thematization. Since there was no imagery manipulation (but imagery control), it would be gratuitous, although not disprovable, to suggest that the experimental subjects formed images in response to the thematic structure.

We would suggest instead that thematization is the fundamental process, but one which has more than one mental activity associated with it. While forming images is one such activity, a more general requirement of understanding a discourse is establishing reference, by whatever means. Different designations must come to converge on a common referent for which predications are made. The context experiment was arranged to bring about such a condition. A word was thematized, not through repetition, but through having its referent contained in propositions.

With respect to this argument, there are relevant data. The number of specific paragraph occurrences of the two sentence nouns was approximately equal so that, in general, the thematized noun was not mentioned more than the non-thematized noun. Thus, the thematization effect could not be due to specific word occurrence. However, there was a range in the number of constituents in which the referents of the two words occurred. Accordingly, each paragraph was scored for its number of propositions and identity constituents (McCawley, 1970b). Each sentence was scored for the difference in its meaning-preserving recall under thematized prompting versus non-thematized prompting. These difference scores were correlated with the corresponding differences between constituent references for the two sentence nouns. For

the thematized subject condition, this (product-moment) correlation was .45, and for the thematized object condition, it was .25. For a sample size of 24, only the first of these is significant beyond the .05 level. However, the correlations are consistent with the hypothesis that thematization is accomplished by the referential processing of propositions and/or identity constituents rather than by the storage of specific words.

Of course, the pattern of results is not so simple as to allow the conclusion that the thematized noun provides best access to the sentence. The apparent puzzle is that while thematizing affected generally the retrieval power of the subject, it did not matter which noun had been thematized. It is the normal state of affairs that the first noun of a sentence is the "topic" of a discourse. Halliday (1970), in fact, has defined "theme" at the clause level to mean the first noun of the clause. James, Thompson, and Baldwin (1973) recently have made the same point, based on results showing superior recall of surface subjects over surface objects. However, in this research, since both nouns from a sentence had occurred prior to the sentence, we are not dealing simply with old versus new information in the discourse. The only new information is the predication of a relationship between two previously introduced nouns.

The explanation is that there is indeed a normal superiority for subject prompt because syntactic subject is normally the theme of a sentence. However, "normally" must be taken to mean that the sentence occurs in some context. The effect of any thematization is to establish normal discourse conditions that allow the sentence subject to be a superior retrieval cue. The effect of object thematization is to establish special object focus and increase the object's access to the representation of the sentence. But it does so not at expense of the subject, which remains as effective as when it has been thematized. To provide any

thematic context is to give focus to the subject of the sentence. This is consistent with Halliday's notion that the first noun is the theme of the sentence--independent of context. Only special discourse features thematize the object.

Finally, we note that these experiments give indirect support to a (S(VO)) grammatical analysis of simple two-term predicates with a transitive relation. The conditional recall probabilities clearly show verb and object to be more closely associated than verb and subject. This fact, of course, does not entail any conclusion about the representation form of linguistic information; however, it is more consistent with syntactically based structures of the sort NP + VP than with the verb-first proposals of Fillmore (1968) and McCawley (1970a).

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